DA 03-24

Before the
Federal Communications Commission
Washington, D.C. 20554

In the matter of

Federal-State Joint Board on Universal Service	CC Docket No. 96-45

Petition for Reconsideration

The Maine Public Utilities Commission (Petitioner), request that the Federal Communications Commission reconsider the Wireline Competition Bureau's (WCBs) Order adopting the Delphi Model ("Delphi Order")which was adopted by the WCB on January 6, 2003, released by the WCB on January 7, 2003 and posted to the Federal Register on February 10,2003.

This Reconsideration Petition is based upon Petitioner's belief that the WCB may have erred when it converted its synthesis cost model to the Delphi computer language and when it made certain other "technical improvements" to the model. Petitioner's belief is supported by comparing the outputs of the cost model both "before" and "after" the new changes. That investigation shows that the reasons provided by the WCB are not sufficient to explain either

the large changes to the length of distribution and feeder facilities, nor the changes to feeder and distribution costs, particularly in small wire centers.

The Delphi Order states that three significant changes were made to the model. The three changes made by the Delphi Order and our estimate of the likely cost effects, are summarized here:

1. Language change. The computer language was changed from Pascal to Delphi. This should have a negligible effect on cost outputs.

2. Manhole lookup. A cost lookup routine was corrected regarding the costs for manholes of different sizes. Apparently the old model, when asked to look up the cost of a large manhole, actually looked up the cost of a small manhole. Correcting this should increase costs in every state, but in a way that is isolatable from other categories of cost

3. Drop terminal costs. The Delphi Order states that a "correction was made to locate drop terminals using the 360 feet square grid cell assumption adopted in the Fifth Report and Order, rather than 1000 feet square grid cells. This correction places drop terminals closer to customer locations and results in an overall decrease in distribution cable and structure costs." Delphi Order at ¶ 10.[1] The expected effect would be a more or less equal cost reduction in drop cost for all rural and urban customers. However, drop costs are a small part of total network investment, usually about three percent.

The Wireline Competition Bureau published with the Delphi Order an estimate of the net cost effect on the states. Costs decreased in Maine by $1.47 or 4.8 percent, in Vermont by $1.72 or 5.3 percent, and in West Virginia by $1.00 or 3.0% percent. At the same time the

[1] Earlier orders and copies of the model interface itself suggest that grid size also can alter the design of feeder and distribution plant. *See, Fifth Report and* Order, ¶ 20 ("After the customer location data have been clustered, a separate module . . . places a fine (square) grid over each cluster. The size of the grid (or "microgrid") is determined by the user; the current default is 360 feet by 360 feet."). *See also*, ¶56, ("the HCPM loop design modules build loop plant directly to individual microgrids in which customers are located.") Given the text of the Delphi Order, however, we assume that no change to the clustering interface module (CLUSTINTF) was intended.

WCB estimated significantly increased costs in other states including North Dakota (+$1.06) and Puerto Rico (+$0.88). Costs increased slightly in California (+$0.22) and New Jersey (+$0.29). The reasonable and likely result of these cost changes change is significantly less support in Maine, Vermont and West Virginia.

Since the Delphi Order was issued, the Maine and Vermont commissions have expended considerable effort trying to understand the statements and results of the Order in relation to the behavior of the Pascal and Delphi models. Our detailed analysis suggests the following:

1. Manholes. As expected, the technical correction to the manhole lookup table produced a significant increase in manhole investment, in some wire centers by 200 percent or more. While the correction is surprisingly large, this result may accurately reflect the underlying cost structures built into the model.
2. Drops. As expected, the technical correction to drop length produced, in most wire centers, a decrease in drop costs.[2] In one case the reduction in drop cost was as much as 13 percent. However, the overall effect on cost was small, primarily because drop cost is a small percentage of total investment.
3. Other. There were other changes to feeder and distribution lengths and to feeder and distribution investment, but of unknown origin. In many cases these unexplained changes were hundreds of times larger than the changes described above. The overall effect was biased against rural areas.[3]

This analysis strongly suggests that the cost changes published with the Delphi Order were primarily the result of unidentified but powerful alterations in either the structure of the cost model itself or in the parameters under which it was run. Petitioner cannot at present

[2] However, some troubling exceptions exist. In several wire centers the drop cost inexplicably increased.

[3] The unexplained cost changes significantly reduced the average cost in small high-cost rural wire centers and slightly increased the cost in larger urban wire centers.

identify the nature of those changes, but our research strongly suggests that they exist. The fact that these unexplained changes are biased against small high-cost rural wire centers means that, if the Delphi Order stands, rural states with many small wire centers, such as Maine, Vermont and West Virginia, are likely to receive insufficient support.

The Commission should not implement the Delphi Order until it provides interested parties a meaningful opportunity to test the accuracy of the Wireline Competition Bureau's calculations. The model language changes and the "technical improvements" adopted in the Delphi Order should be stayed pending further review by the Commission.

The results of our preliminary analysis are summarized in Appendix A. Information that we believe is needed to validate the Delphi Order is described in Appendix B.

Respectfully submitted

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Appendix A
Cost Result Anomalies Involving Maine Data

1. Feeder and Distribution Distances

a) A change to customer locations can significantly alter clustering, and thus could move the feeder-distribution interface. To avoid this, we used as the analysis variable the total of feeder and distribution length.

b) In Maine, the Delphi Order reduced the feeder-distribution distance by 5%.

c) A 5% reduction in average feeder-distribution distance is about 10 feet per line. Is drop distance included in the model output's data described as distribution distance? If so, ten feet seems a reasonable, possibly even a small, correction based on shorter drop lengths.

d) The wire center detail in Maine show a lot of divergence and variability. One wire center in Maine decreased by 221 feet. Another had an increase of 81 feet.

i. This variability seems inexplicable from the manhole cost and drop length changes.
ii. Why would feeder-distribution distance increase in any wire center under these conditions?

e) Medium-sized wire centers seem to have the greatest variability in the size of the change. At about 5,000 lines, wire centers seem to have much greater variability in the direction and amount of the change caused by the use of the Delphi model. Why would this be the case?

2. Manhole Costs

a) The model parameters indicate that a 2-duct manhole costs only $1,400, a 4-duct manhole costs at least $4,400 and a 9-duct manhole costs at least $5,100. Given this large cost difference between 2-duct manholes and larger manholes, a change in the lookup table could be expected to produce a large difference in cost outcome for manhole investment.

b) In Maine, feeder manhole investment increased by 222 percent. Initially this is a very large increase, but it is understandable in light of the above cost structure.

3. Drop costs

a) Drop investment decreases in Maine by 5% due to Delphi. This decrease is smaller than one might expect when drop length goes from a function of 1,000 feet to the same function of 360 feet. Why doesn't the drop length cost decrease more?

b) Still, the overall effect of drop investment on average cost is negligible.

i. Drop investment in Maine is only 3.3% of total investment ($36.5 MM out of $1,177 MM investment).

ii. A 5% reduction to a quantity that is only 3.3% of the total investment produces an effect of only 0.16% of total investment.

4. Other Cost Changes

a) We defined a parameter ("F-D Cost"). This is the cost of feeder and distribution investment, but it was designed to control for the expected effects of the Delphi Order. Specifically, F-D Cost:

i. Included sequential model output columns titled "copper feeder cable u/g" through "feeder pole inv" to represent total feeder investment, but the manhole investment column was excluded.

ii. Included the sequential columns "distribution cable underground" through "distribution poles" to represent distribution investment.

iii. Did not include any drop investment, which was listed in the model output in a separate column outside the above column ranges.

b) F-D Cost therefore should approximately reflect the total cable, wire and pole cost in feeder and distribution plant, but exclude categories of investment that are irrelevant to the Delphi translation (such as NID cost) or those for which the Delphi Order was expected to make a significant change, namely manhole investment and drop investment.

c) Accordingly, F-D Cost should have remained invariant through the translation from Pascal to Delphi and the inclusion of the two technical corrections regarding manholes and drops. At most it should have changed a very small amount due to different rounding errors in the Pascal and Delphi software.

d) The actual results showed substantial changes in F-D Cost due to the Delphi translation. The results are biased against small wire centers.

i. Overall, F-D Cost decreased for Maine customers by $90 per line.

ii. Some wire centers saw small increases in F-D Cost. These tended to be larger wire centers, usually with more than 10,000 total lines.

iii. Almost all smaller wire centers saw a decrease in F-D Cost.

iv Some small wire centers have very large decreases in F-D Cost. One wire center with 189 lines had its F-D cost decrease by $1,450 per line.

v. As size increased, the variability of the change decreased. Also, the upper and lower bounds of the possible change increased.

vi. Typically, under the Delphi Order, F-D Cost changed as follows:

1. In a wire center of 500 lines, Delphi produced an investment change between approximately minus $20 and minus $1,200.

2. In a wire center of 1,000 lines, Delphi produced an investment change between approximately minus $10 and minus $900.
3. In a wire center of 5,000 lines, Delphi produced an investment change between approximately minus $0 and minus $300.
4. In a wire center of 10,000 lines, Delphi produced an investment change between approximately plus $30 and minus $150.
5. In a wire center of 50,000 or 100,000 lines, Delphi produced an investment change between approximately plus $40 and $0.

vii. In summary, the Delphi conversion inexplicably reduced investment significantly in most small wire centers, with the greatest reductions in the very smallest wire centers. It also slightly increased investment in most large wire centers. The net result is that costs under Delphi are more homogeneous than under Pascal.

viii. This can reasonably be expected to reduce support to rural areas in two ways. First, it increases the national average cost because large wire centers have great influence on the national average. Second, rural areas with a high proportion of small wire centers appear to have lower costs and therefore need less support.

e) The most significant unexplained effect of the Delphi conversion appears to involve buried distribution lines.

i. In Maine, the investment cost for buried distribution decreased by $7.5 million or 8 percent, and buried distribution cable placement decreased by $47 million or 18 percent. These two categories alone accounted for a net decrease in F-D Cost of $54.5 million, or 72 percent of the total decrease of $75.5 million that Delphi changes F-D Cost for Maine.

ii. We are unaware of any reason why buried distribution investment should be substantially decreased as a result of any of the announced changes in the Delphi Order.

Appendix B
Information Needed to Validate the Delphi Order Charges

1) Pascal to Delphi Language Conversion

   a) What were the sequential steps taken in converting from the Pascal model to the Delphi model with corrections? For each step, what changes were made and how were they made? To program code? To runtime parameters? To input files?

   b) For each step, was a controlled test performed showing the results before and after the change? Were the test results saved? Can they be made available?

   c) In particular, did the FCC ever produce a comparable "apples to apples" comparison study showing that the language translation from Pascal to Delphi did not alter outputs? If so, what other changes, if any, were included in the Pascal version from the version that was used for 2002 support?

   d) Are the runtime parameters the same in the old Pascal and new Delphi models? Including clustering algorithms? Should the old and new models produce the same clusters in a given wire center? If not, why not?

2) Manholes

   a) The Delphi Order speaks about changing a lookup table for manhole costs. What are the elements in the table? What cells was the program supposed to look in, and what cells did it actually look in? Approximately how often did this error occur as a percentage of all manhole cost lookups?

3) Grid size and drops

   a) The Delphi Order speaks about grid size affecting drop costs. How was the cost model altered to reflect this change? What changes were made to program code, runtime parameters, input files?

   b) Was the change solely, as described in the Delphi Order, to the length of customer drops? If not, what other related changes were made?

   c) How did the change in grid size affect the length of customer drops? What was the typical length before and after? Did the change also affect multi-user drops?

   d) Would any of the changes listed in 3)a) above affect the clustering module? Which of the above changes? How would the changes affect that module?

e) Would any of the changes listed in 3)a) above affect the "CLUSTINTF" module? Which of the above changes? How would the changes affect that module?

f) Would any of the changes listed in 3)a) above affect the module that calculates feeder and distribution investment? Which of the above changes? How would the changes affect that module?

g) Would any of the changes listed in 3)a) above affect the module that calculates feeder and distribution expense? Which of the above changes? How would the changes affect that module?

h) On the model output files, at tab "Investment Input," column AI, there is a column heading marked "drop inv." Is this the place where a change in drop investment should appear? Is it the only place? If not, what other investment columns showing investment could reasonably be expected to show changes? What other expense columns?

4) Cost Effects

a) Overall Cost. The Bureau has published a state-by-state description of how the model changes affect state average costs.

i) How is it possible that costs decrease so much in some states like Maine, but increase in other rural states like North Dakota? What changes produce this effect?

ii) How much of the cost effects at the state level can be explained by the grid size/drop length change? (Note that the overall investment in drops is small as a % of total investment.)

iii) How much of the cost effects at the state level can be explained by the manhole correction?

iv) Are there other significant changes that explain the cost effects at the state level but that were not identified in the Delphi Order?

b) Distribution Cost. FCC staff has provided more detailed information concerning Verizon-Maine and GTE-Michigan. That information shows, consistent with the model outputs, several varieties of distribution investment cost. The data show a decrease of 12% in overall distribution cost in Maine and a decrease of 8% in Michigan. What changes to the program are chiefly responsible for these reductions?

c) Feeder-Distribution Cost. Because a change to clustering can theoretically alter the feeder-distribution interface, we examined the total investment for outside plant, adding together feeder and distribution, in each wire center (excluding manholes and drops and excluding largely irrelevant features like NIDs). Unexpectedly, the resulting variable was substantially affected by the conversion from Pascal to Delphi. A large decrease occurs in many small wire centers. There are also significant increases in some larger wire centers.

   i) What changes in the program, runtime parameters or input files could explain this behavior?

   ii) In particular, why could or should the result greatly reduce investment in smaller wire centers?

   iii) Also, why could or should the result significantly increase investment in larger wire centers?

   iv) How can those changes be reversed or isolated for testing purposes?